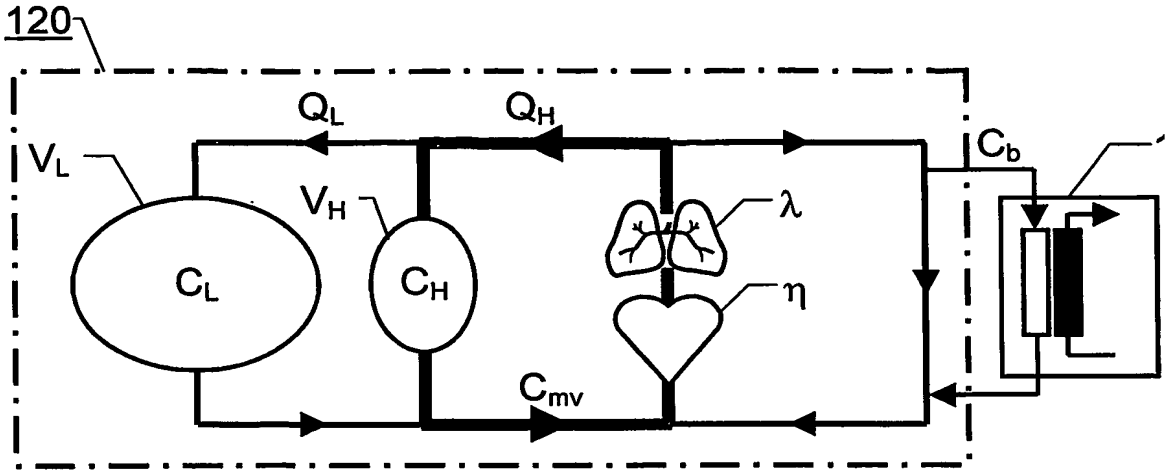


Fig. 1

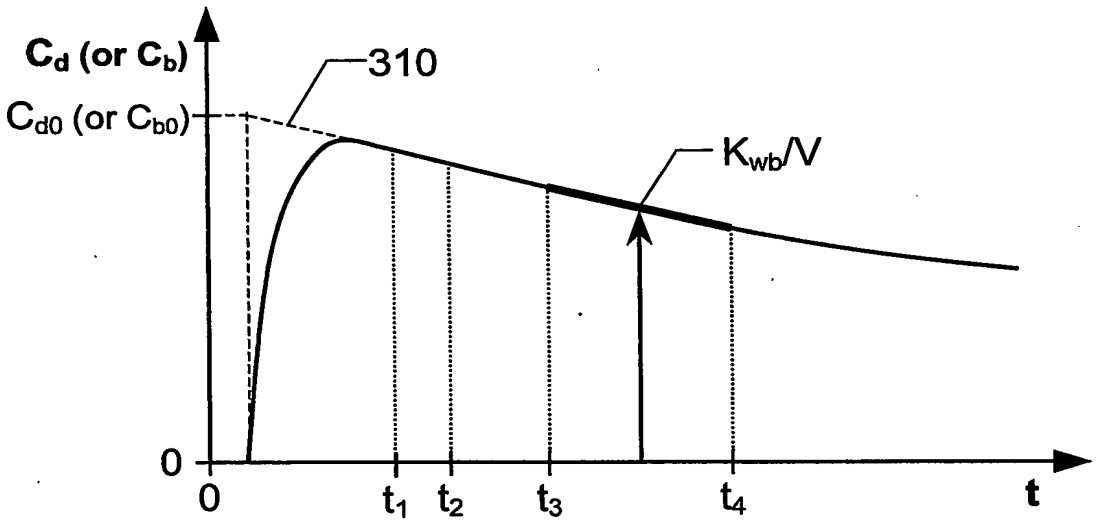


Fig. 3

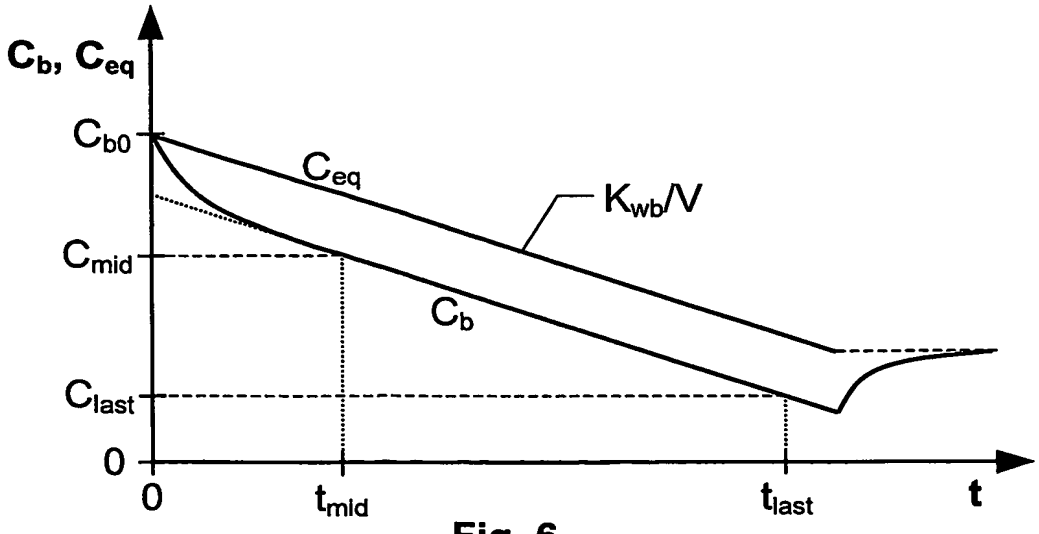


Fig. 6

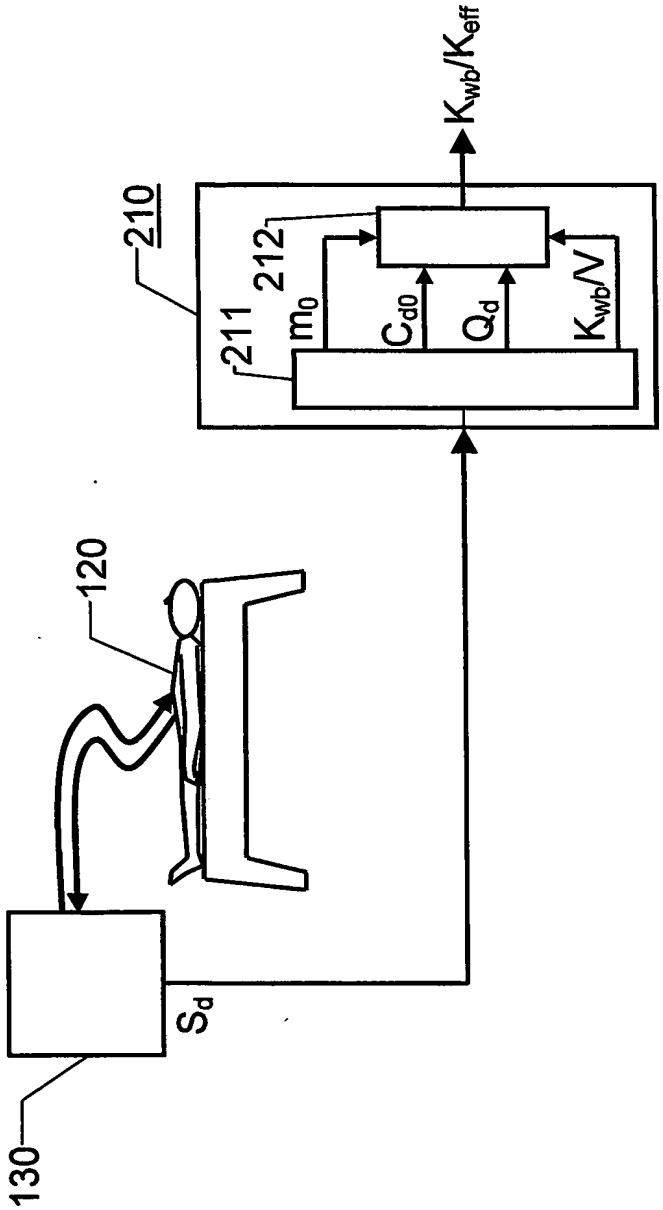


Fig. 2

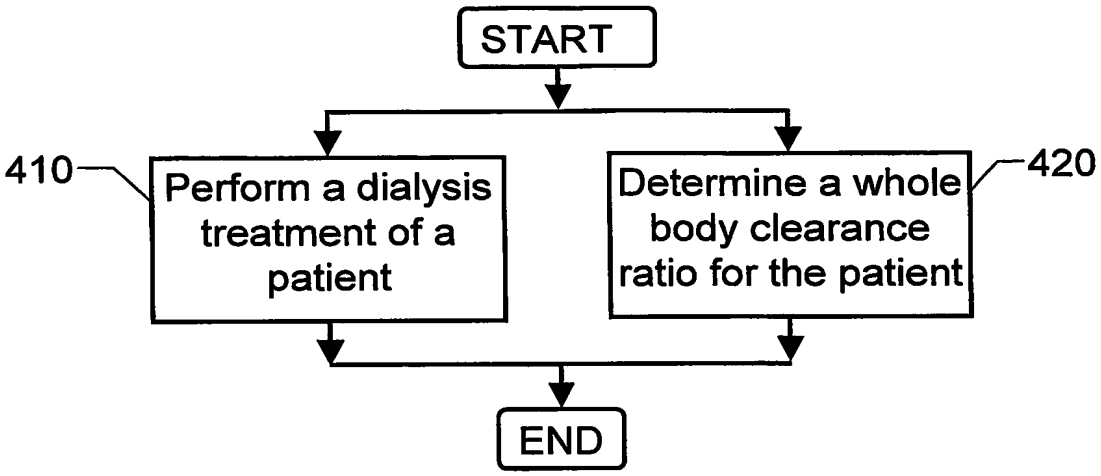

START
410
Perform a dialysis treatment of a patient
Determine a whole body clearance ratio for the patient
420
END

Fig. 4

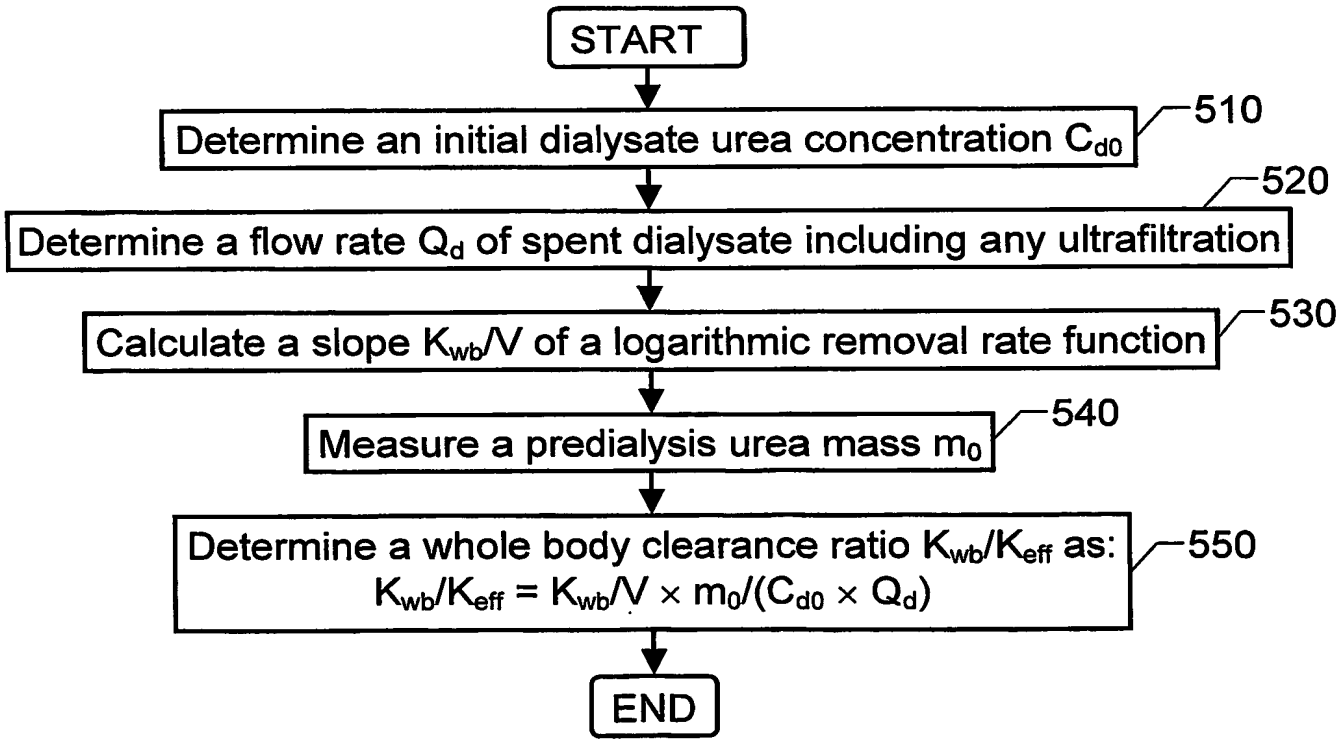

START
Determine an initial dialysate urea concentration C_{d0}
510
Determine a flow rate Q_d of spent dialysate including any ultrafiltration
520
Calculate a slope K_{wb}/V of a logarithmic removal rate function
530
Measure a predialysis urea mass m_0
540
Determine a whole body clearance ratio K_{wb}/K_{eff} as:
$K_{wb}/K_{eff} = K_{wb}/V \times m_0/(C_{d0} \times Q_d)$
550
END

Fig. 5

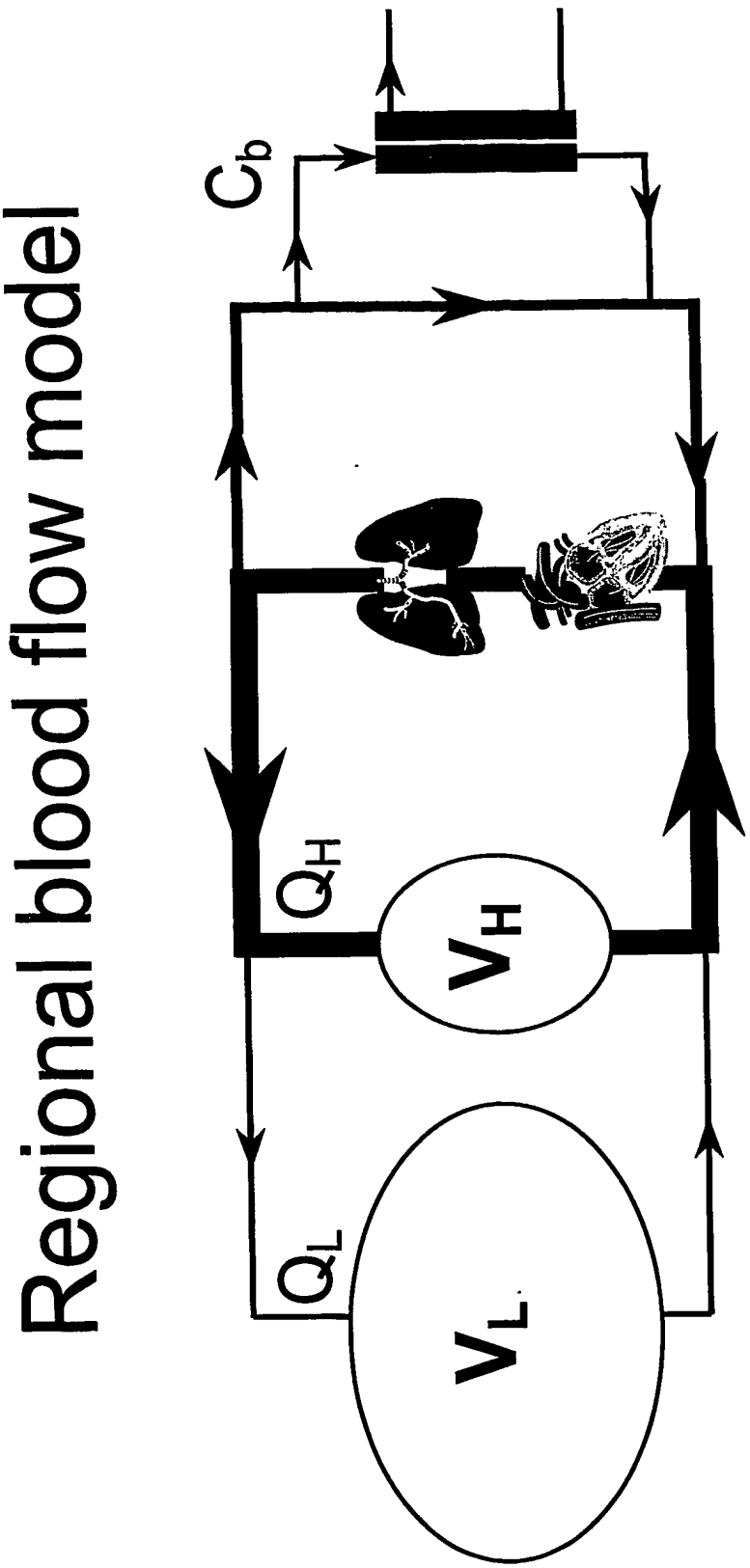
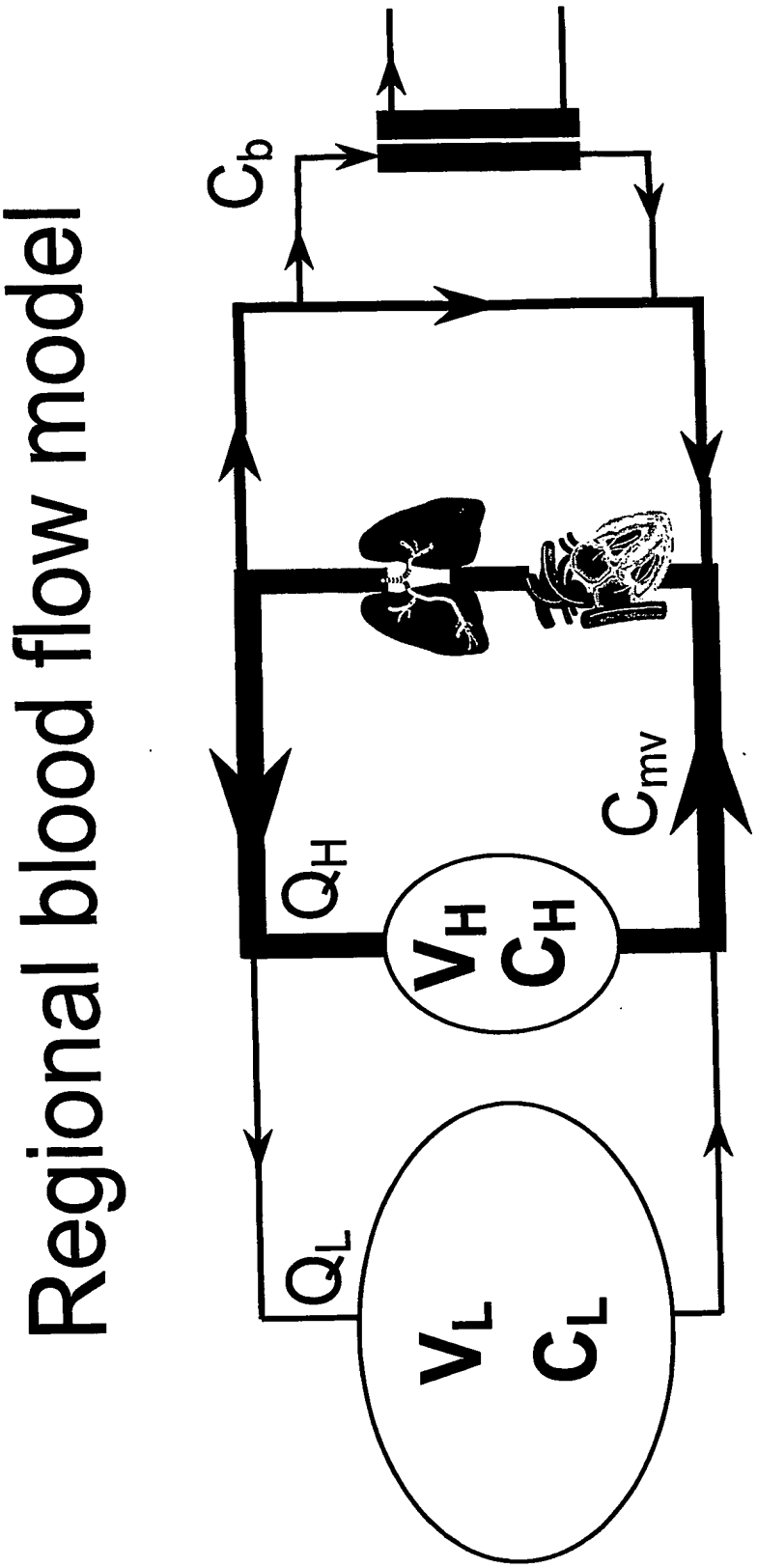
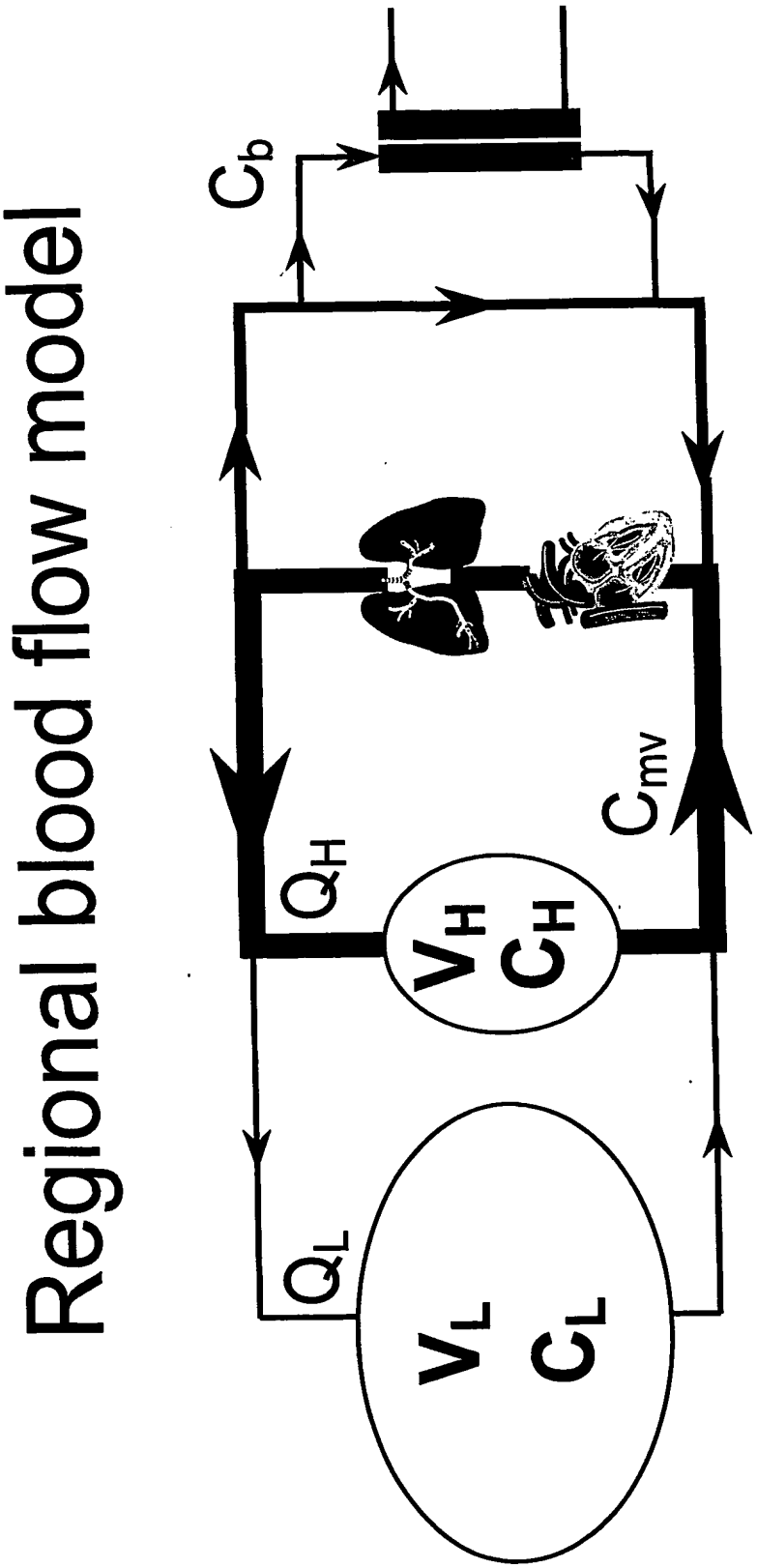


Fig. 7



$$C_{mv} = \frac{Q_H \cdot C_H + Q_L \cdot C_L}{Q_H + Q_L}$$

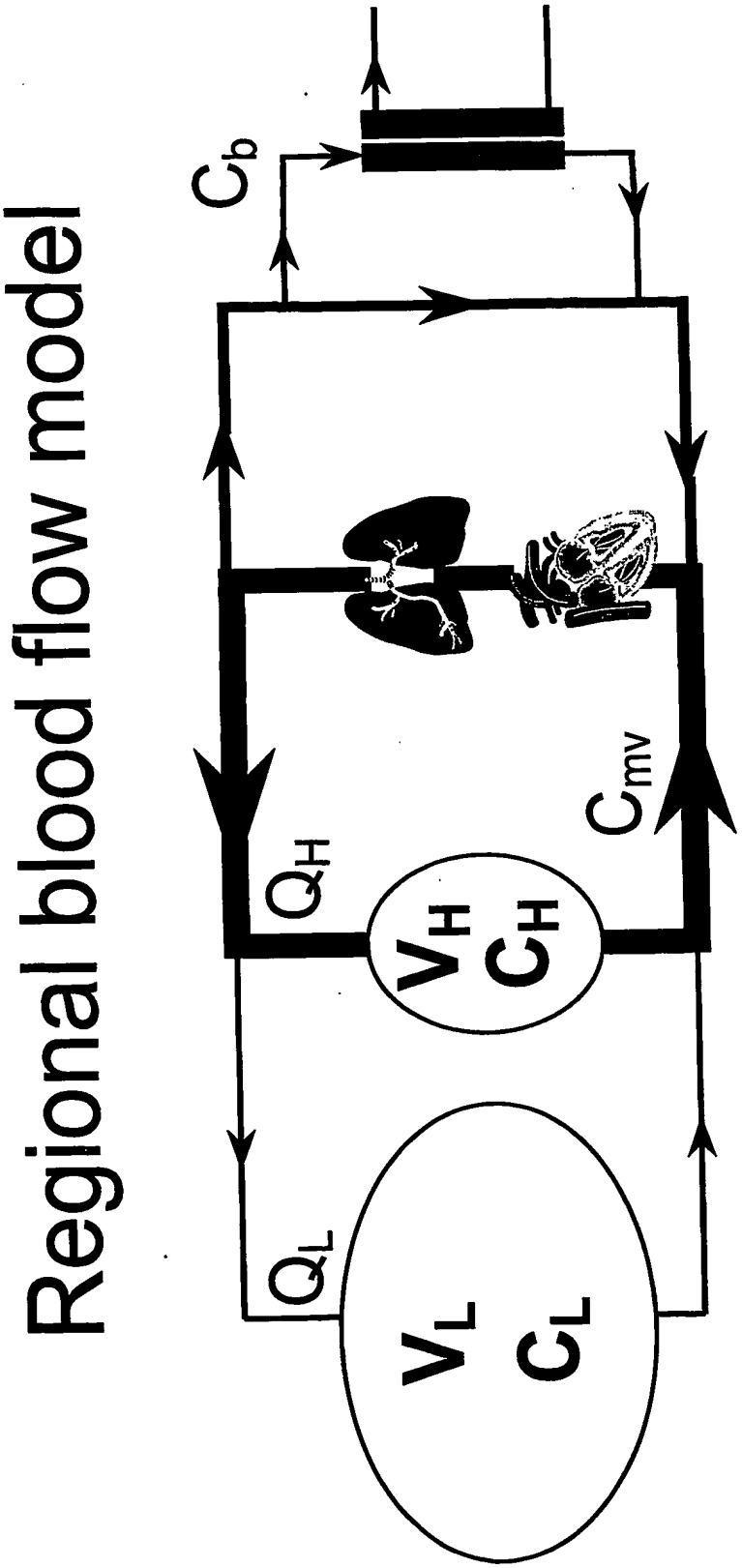
Fig. 8



$$C_{mv} = \frac{Q_H \cdot C_H + Q_L \cdot C_L}{Q_H + Q_L}$$

$$C_{eq} = \frac{V_H \cdot C_H + V_L \cdot C_L}{V_H + V_L}$$

Fig. 9



$$C_{mv} = \frac{Q_H \cdot C_H + Q_L \cdot C_L}{Q_H + Q_L} \qquad C_{eq} = \frac{V_H \cdot C_H + V_L \cdot C_L}{V_H + V_L}$$

$$\boxed{C_L > C_{eq} > C_{mv} > C_H > C_b}$$

Fig. 10

Definitions of clearance

- Dialyzer clearance (In vivo) — K = removal rate / C_b
- Effective clearance (OnLine Clearance, Diascan) — Keff = removal rate / C_{mv}
- Whole body clearance (Equilibrated clearance) — Kwb = removal rate / C_{eq}

$$K > Keff > Kwb$$

Fig. 11

Measurement of effective clearance

- Through the effect of the dialyzer on a step in the inlet conductivity (Diascan)
- From the dialysate flow rate and the initial dialysate concentration together with the predialysis plasma water concentration

Fig. 12

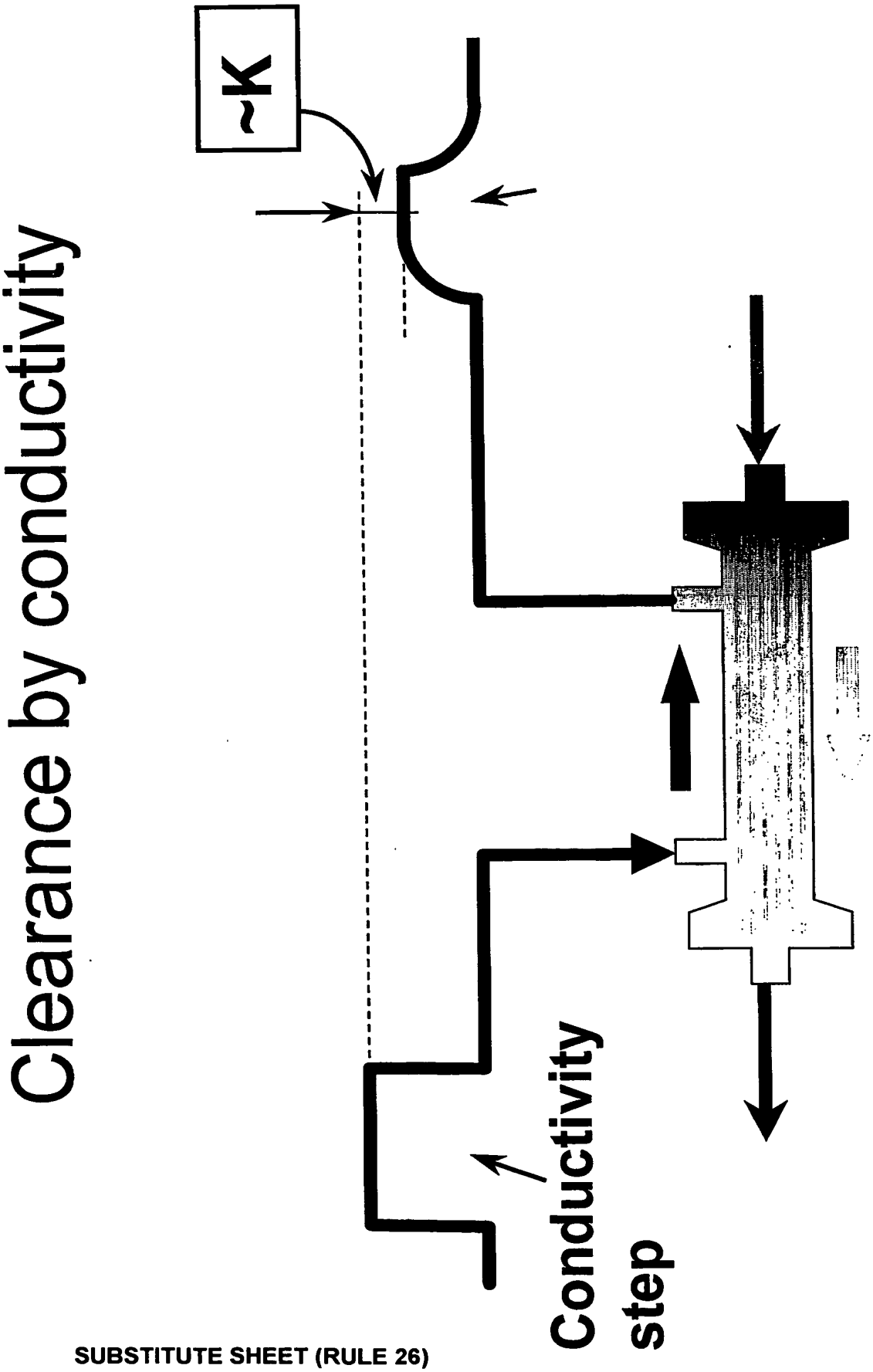


Fig. 13

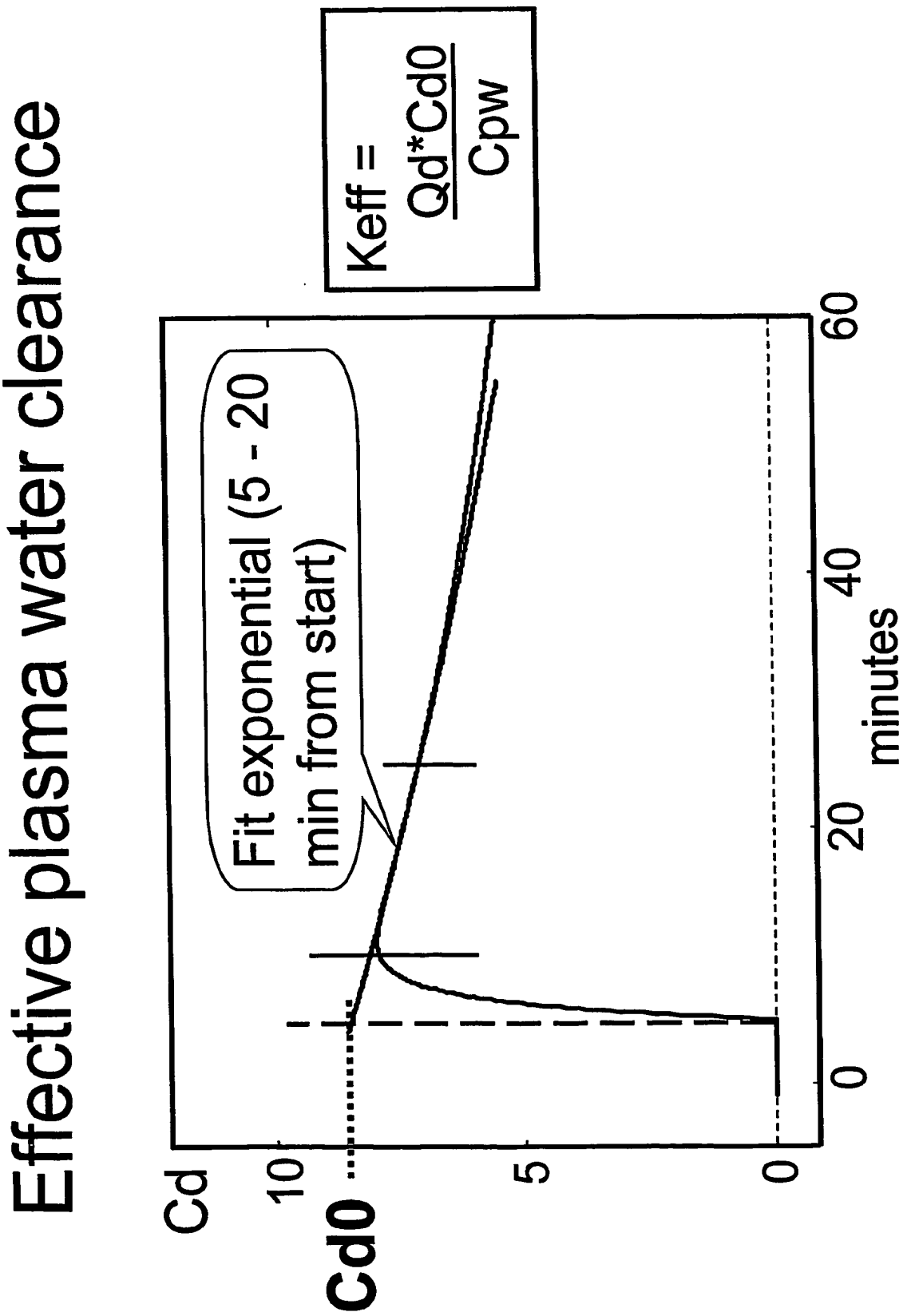

Effective plasma water clearance
Keff = Qd*Cd0 / Cpw
Fit exponential (5 - 20 min from start)
Cd
Cd0
10
5
0
0
20
40
60
minutes

Fig. 14

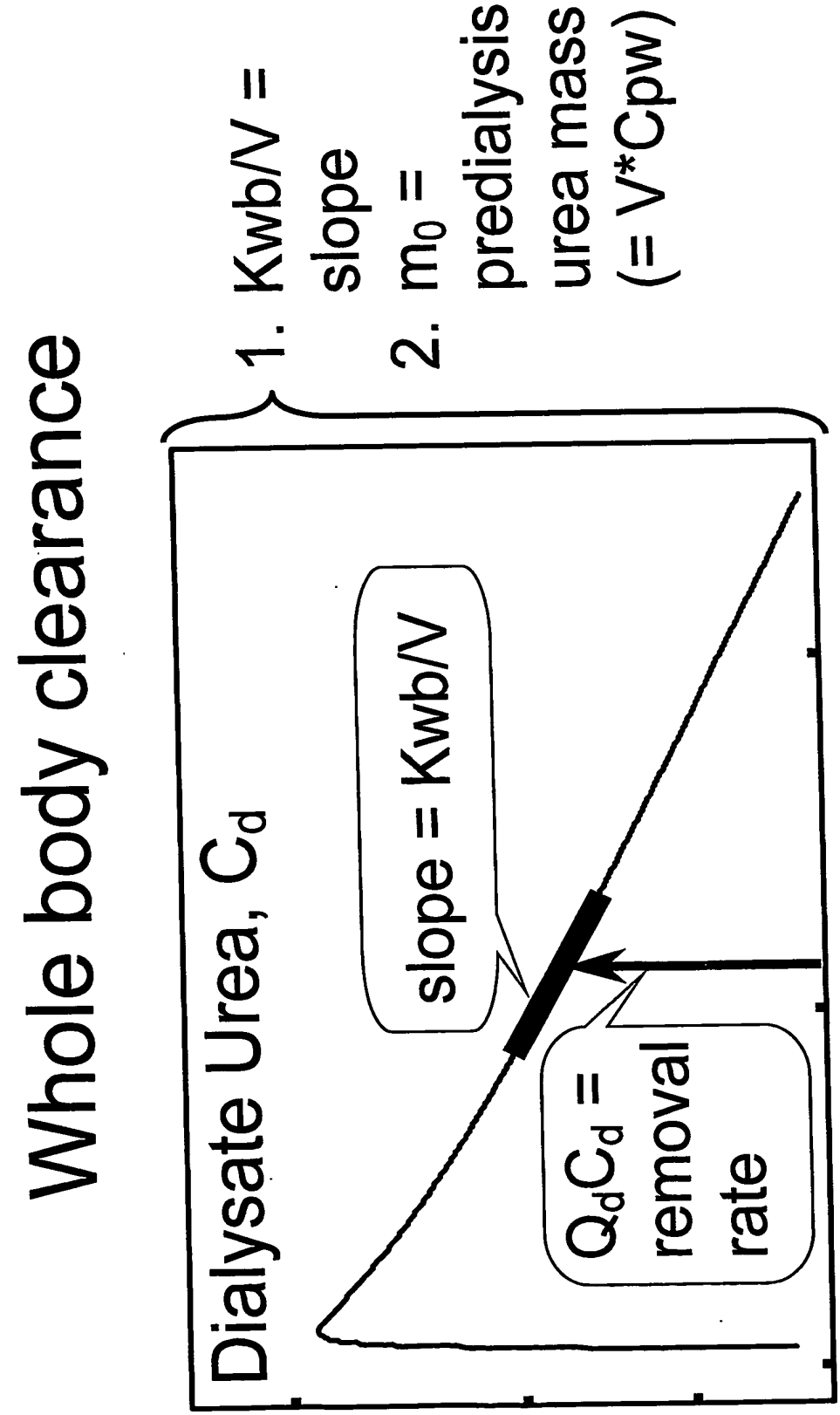

Whole body clearance
1. Kwb/V = slope
2. m_0 = predialysis urea mass (= V*Cpw)
Dialysate Urea, C_d
slope = Kwb/V
Q_dC_d = removal rate

Fig. 15

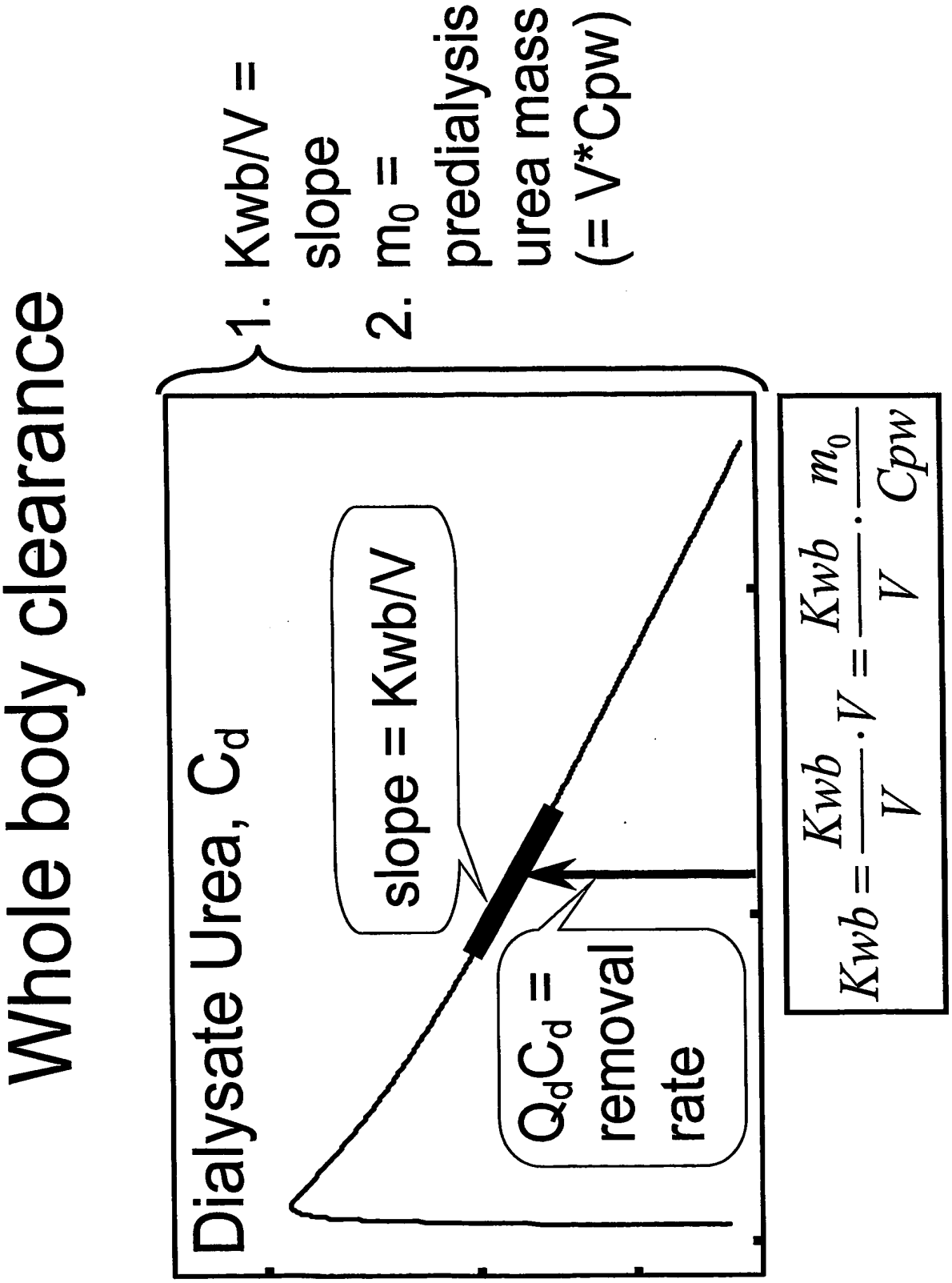

Whole body clearance
1. Kwb/V = slope
2. m_0 = predialysis urea mass (= V*Cpw)
Dialysate Urea, C_d
slope = Kwb/V
Q_dC_d = removal rate
$Kwb = \frac{Kwb}{V} \cdot V = \frac{Kwb}{V} \cdot \frac{m_0}{Cpw}$

Fig. 16

- 80 treatments of 20 patients (5 M/15 FM)
- Machines: Urea monitor (for Kwb) and
  - Integra (42) for Kcond and Keff
  - C3 (38) for Keff

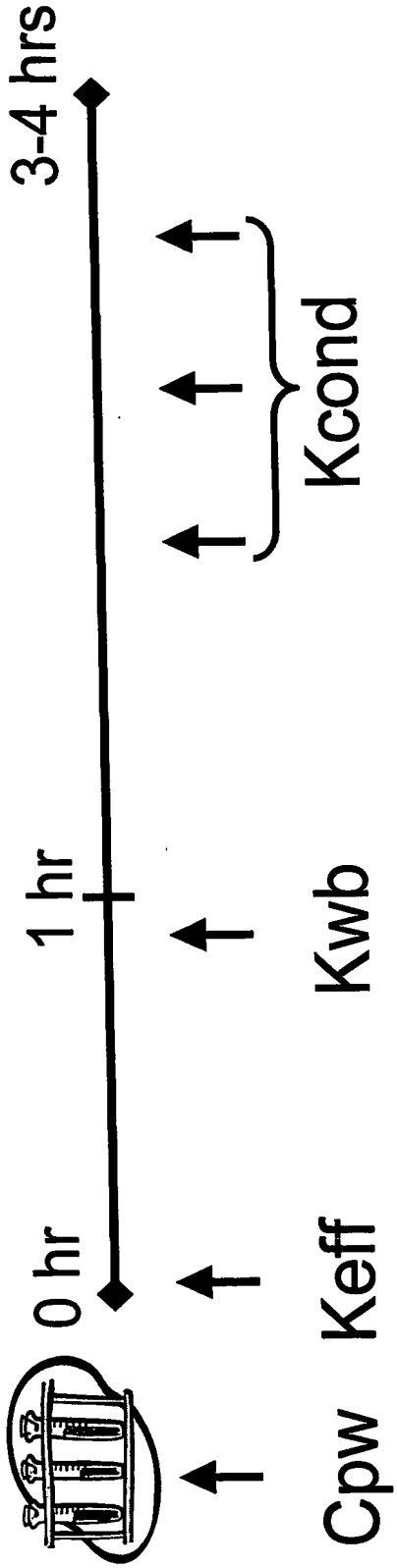


Fig. 17

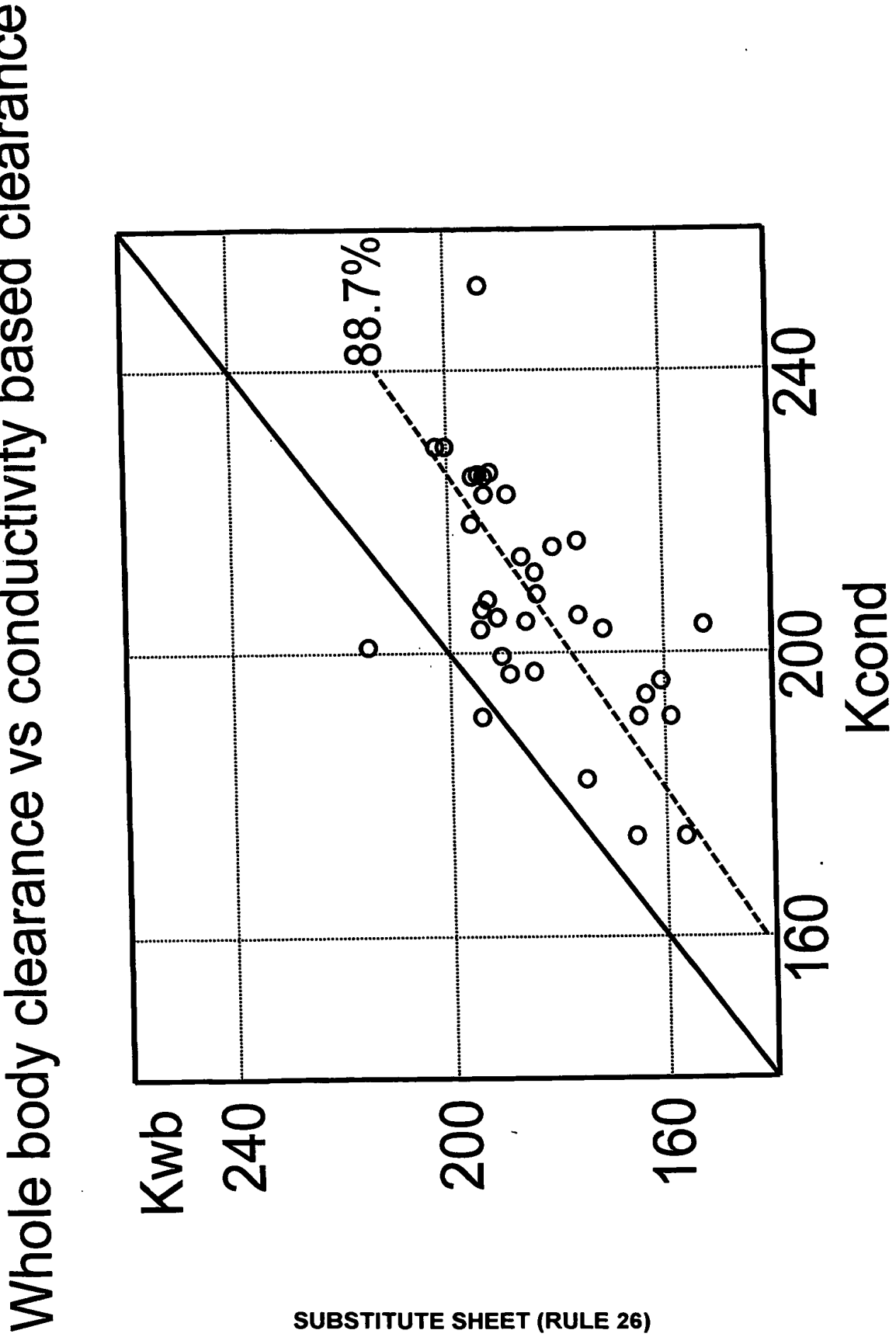

Whole body clearance vs conductivity based clearance
88.7%
Kwb
240
200
160
240
200
160
Kcond

Fig. 18

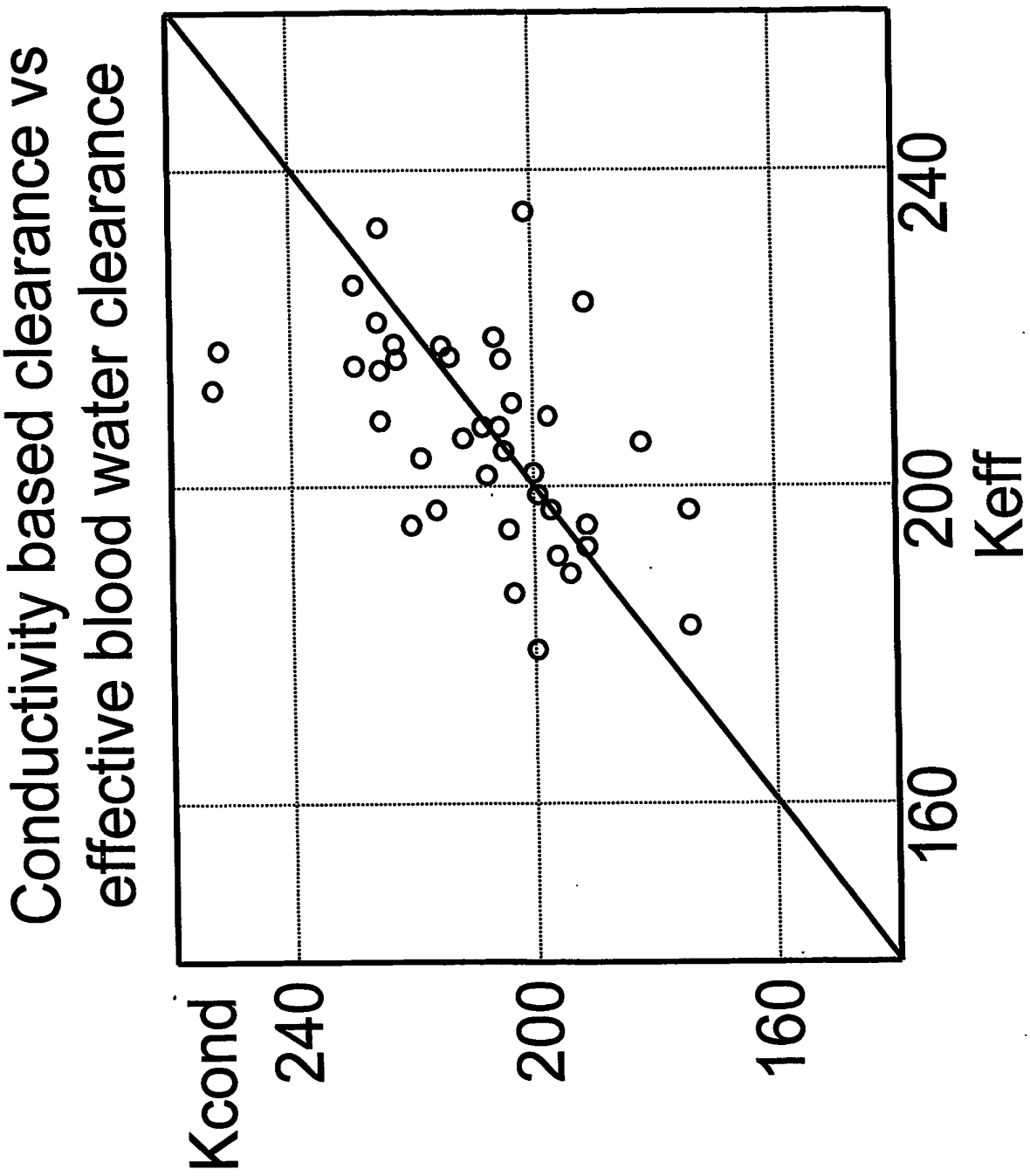

Conductivity based clearance vs effective blood water clearance
Kcond
240
200
160
240
200
160
Keff

Fig. 19

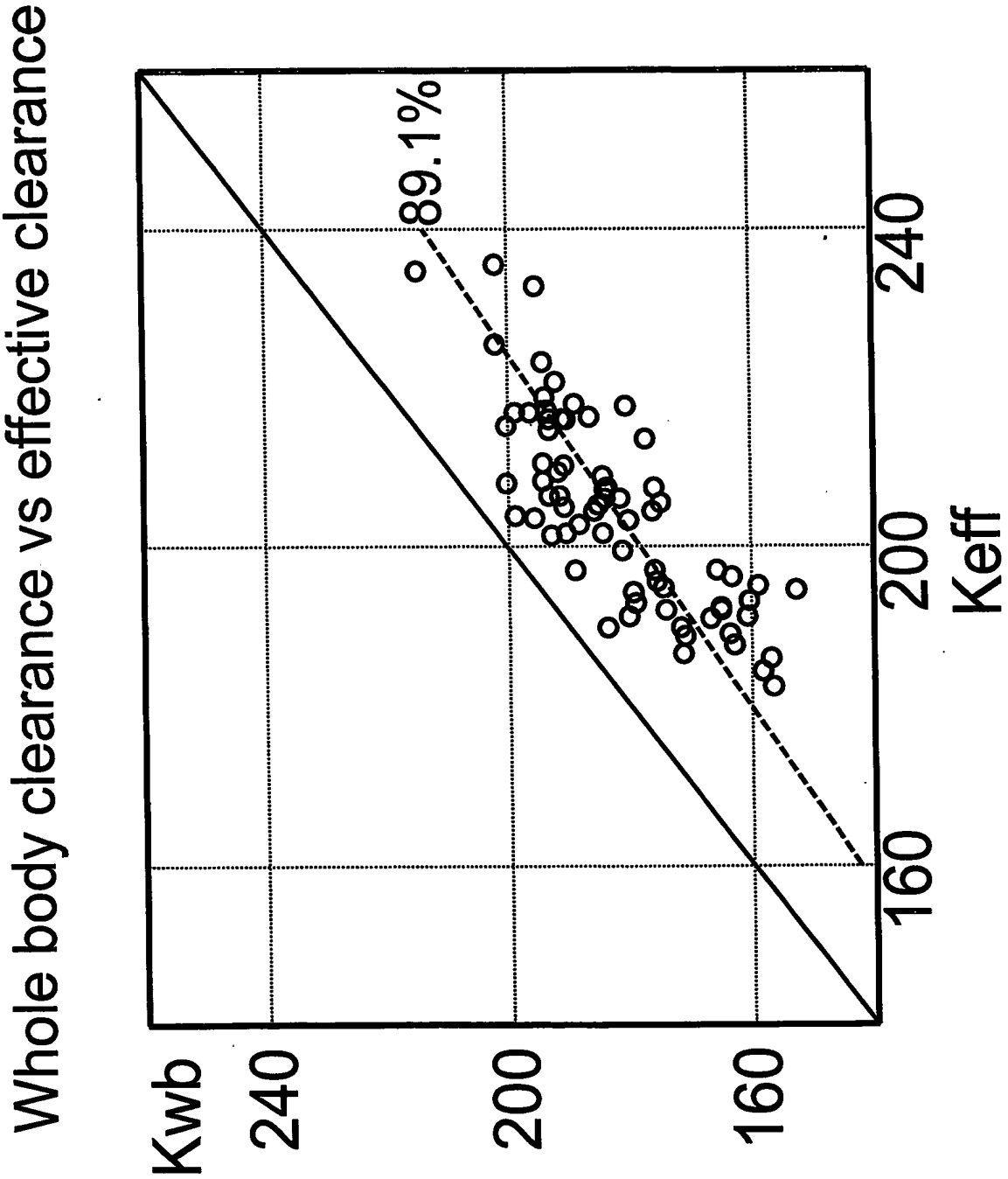

Whole body clearance vs effective clearance
89.1%
Kwb
240
200
160
240
200
160
Keff

Fig. 20

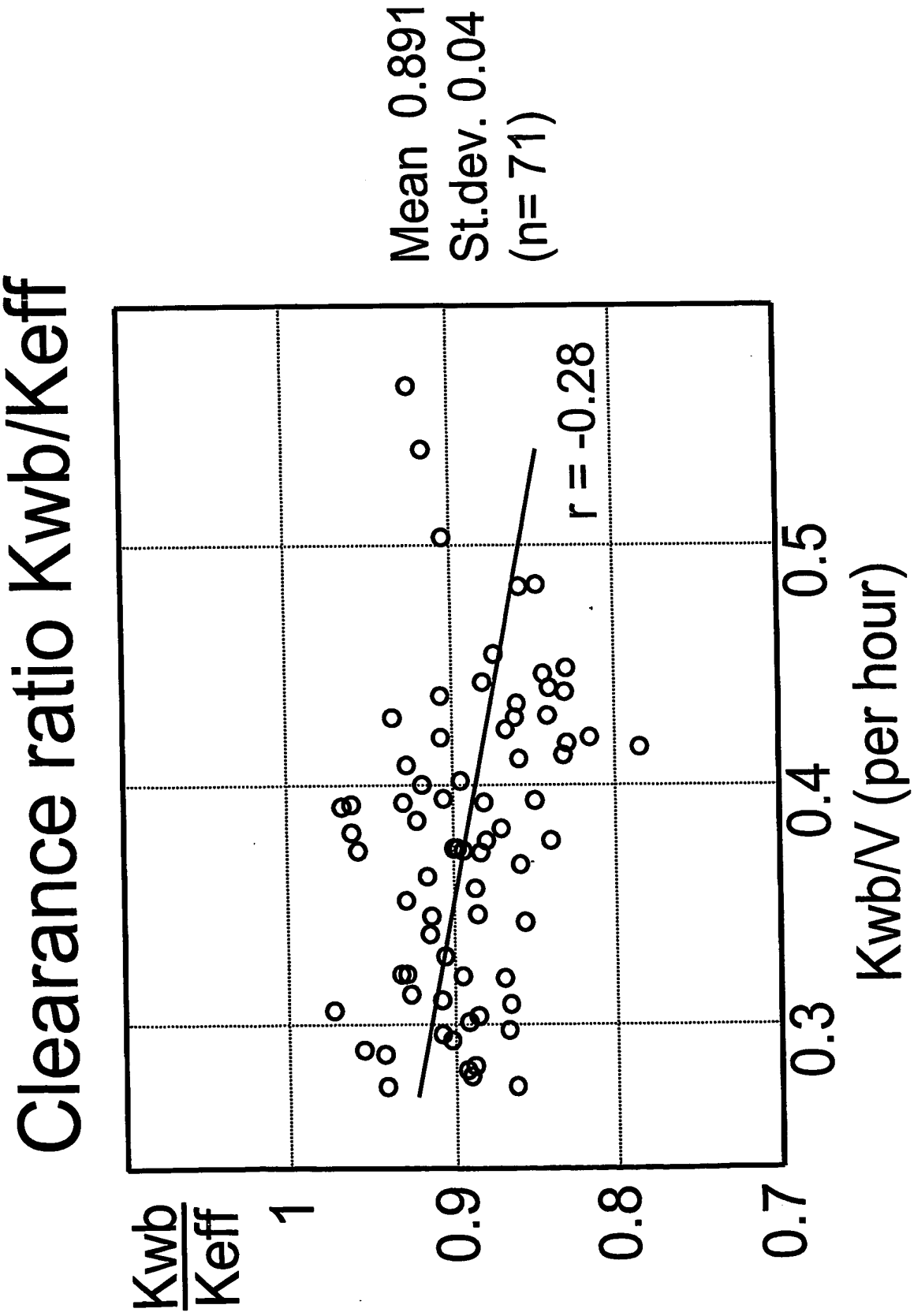

Clearance ratio Kwb/Keff
Mean 0.891
St.dev. 0.04
(n= 71)
r = -0.28
Kwb/Keff
1
0.9
0.8
0.7
0.3
0.4
0.5
Kwb/V (per hour)

Fig. 21

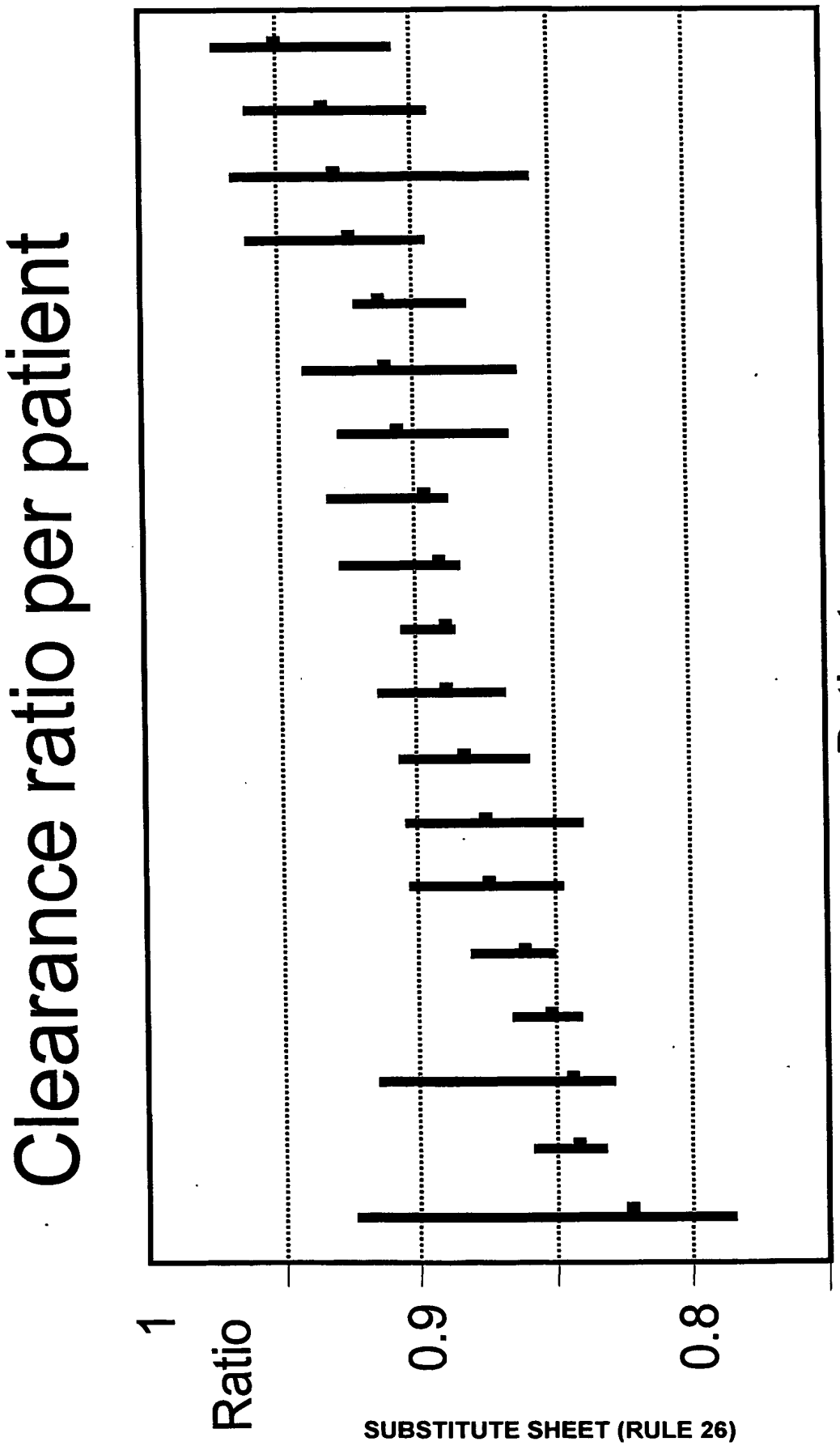


Fig. 22

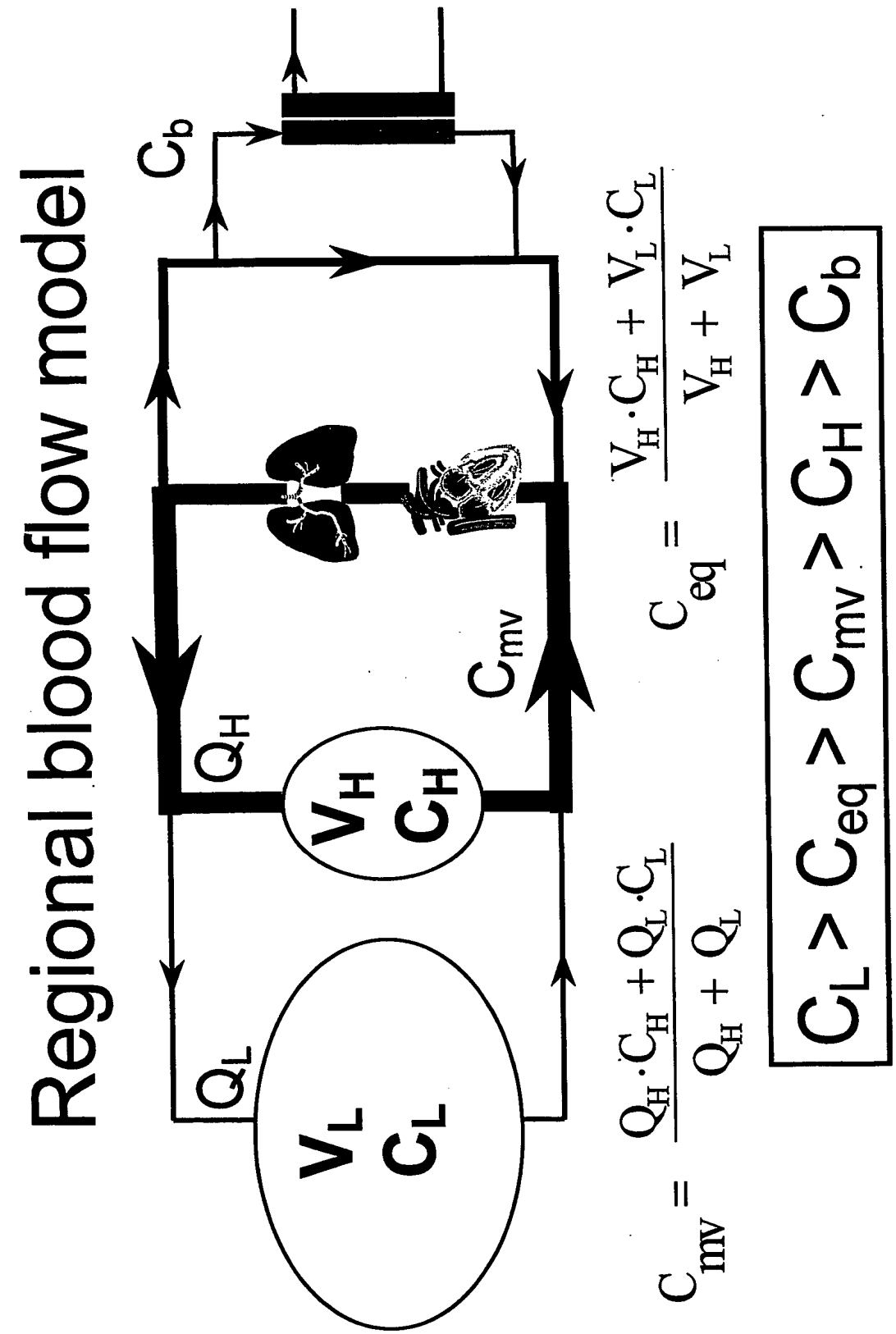

Regional blood flow model
C_b
Q_H
V_H
C_H
C_{mv}
Q_L
V_L
C_L
$C_{mv} = \frac{Q_H \cdot C_H + Q_L \cdot C_L}{Q_H + Q_L}$
$C_{eq} = \frac{V_H \cdot C_H + V_L \cdot C_L}{V_H + V_L}$
$C_L > C_{eq} > C_{mv} > C_H > C_b$

Fig. 23

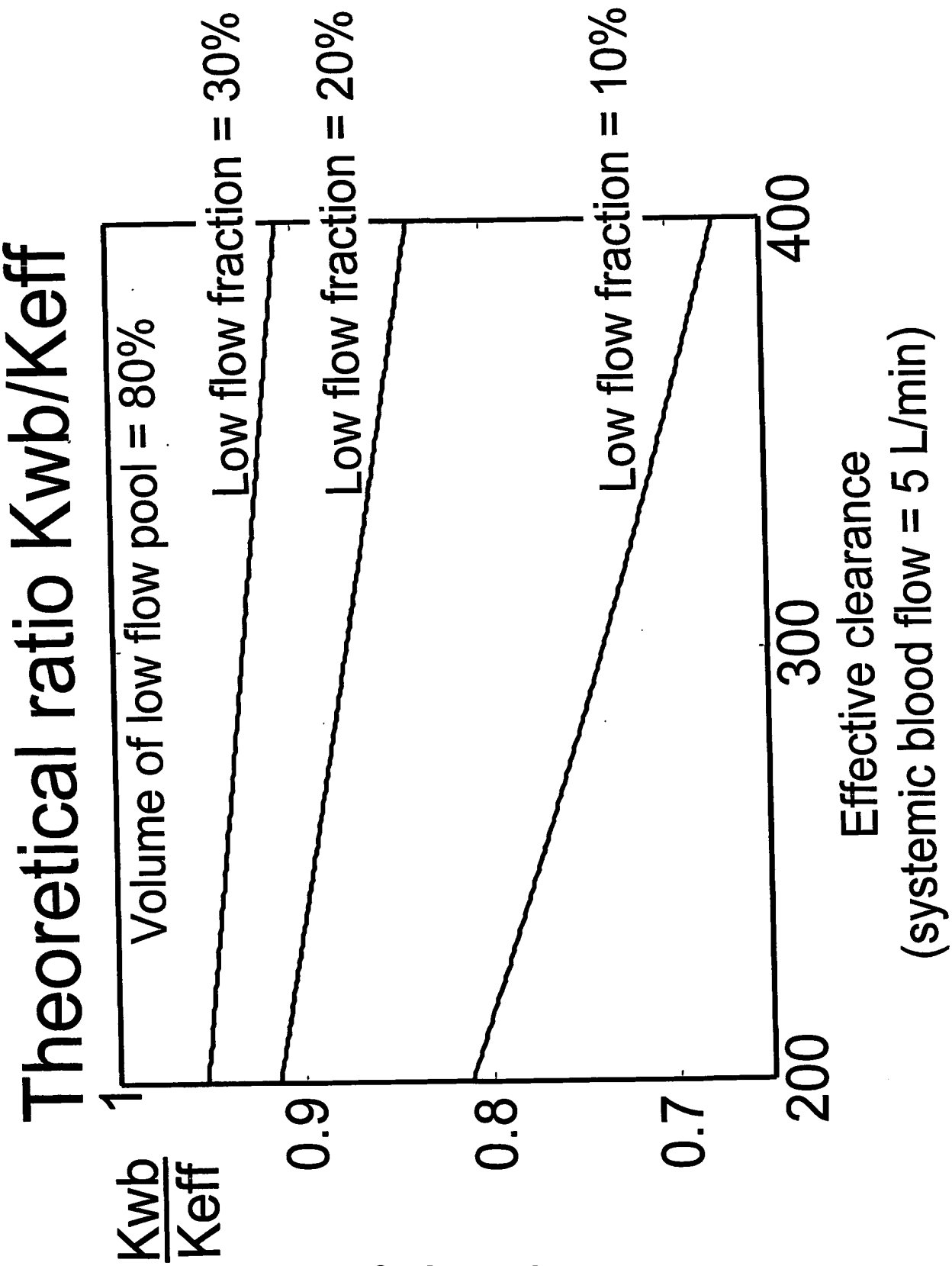

Theoretical ratio Kwb/Keff
Kwb/Keff
1
0.9
0.8
0.7
Volume of low flow pool = 80%
Low flow fraction = 30%
Low flow fraction = 20%
Low flow fraction = 10%
200
300
400
Effective clearance
(systemic blood flow = 5 L/min)

Fig. 24